

<p>Substitute for form 1449A-B/PTO</p> <p><b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b></p> <p><i>(use as many sheets as necessary)</i></p>	Complete if Known	
	Application Number	09/539,486
	Filing Date	March 30, 2000
	First Named Inventor	Sergey A. Selifonov
	Group Art Unit	1631
	Examiner Name	Zhou S.
Attorney Docket Number	02-028940US	

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U.S. PATENT DOCUMENTS

## FOREIGN PATENT DOCUMENTS

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Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published
<i>W</i>	AA	DIATCHENKO ET AL. (1996) "Suppression subtractive hybridization: A method for generating different regulated or tissue-specific cDNA probes and libraries." PNAS USA 93:6025-6030
<i>A</i>	AB	SHAO ET AL. (1998) "Random-priming in vitro recombination: an effective tool for directed evolution." <i>Nucleic Acids Research</i> 26(2):681-683

**\*EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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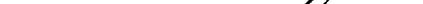
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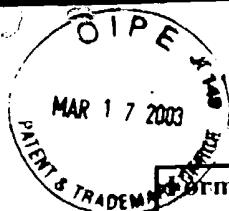
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A	AE	Deweyst et al. (1998) "Non-equilibrium Thermodynamics of Molecular Evolution." <i>J. Theor Biol.</i> 193:593-599	
A	AF	Morchio et al. (1997) "Simulation of Protein Evolution: Evidence for a Non-linear Aminoacidic Substitution Rate." <i>Riv Biol</i> 83-94	

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#### U.S. Patent Documents

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<i>IA</i>	A1	6,125,331	9/26/00	Toh			
<i>IA</i>	A2	6,403,312	6/11/02	Bassil, et al			
	A3						

#### Foreign Patent or Published Foreign Patent Application

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<i>IA</i>	B1	WO00/47612	8/17/00	WIPO				
	B2	WO01/61344	8/23/01	WIPO				
	B3	WO00/42559	7/2/00	WIPO				
<i>IA</i>	B4	WO01/75767	10/11/01	WIPO				

#### Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
<i>IA</i>	C1	Young et al., "Characterization of Receptor Binding Determinants of Granulocyte Colony Stimulating Factor," <i>Protein Science</i> 6:1228-1236, 1997
	C2	Dahiyat and Mayo, "Protein Design Automation," <i>Protein Science</i> , 5:895-903, (1996)
	C3	Su et al., "Coupling Backbone Flexibility and Amino Acid Sequence Selection in Protein Design," <i>Protein Science</i> , 6:1701-1707, (1997)
	C4	Voigt et al., "Computationally Focusing the Directed Evolution of Proteins," <i>Journal of Cellular Biochemistry Supplement</i> , 37:58-63 (2001)
	C5	Hellberg et al., "Minimum Analogue Peptide Sets (MAPS) for quantitative Structure-Activity Relationships," <i>Int. J. Peptide Protein Res.</i> 37:414-427 (1991)
	C6	Martin van Heel, "A New Family of Powerful Multivariate Statistical Sequence Analysis Techniques," <i>J. Mol. Biol.</i> , 220:877-887 (1991)
	C7	Goldman et al., "Estimating Protein Function From Combinatorial Sequence Data Using Decision Algorithms and Neural Networks," <i>Drug Dev. Research</i> 33:125-132 (1994)
<i>IA</i>	C8	Gustafsson et al., "Exploration of Sequence Space for Protein Engineering," <i>J. Mol. Recognit.</i> 14:308-314 (2001)

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*Shaffer 12/21/04*



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<i>(initials)</i>	C9	Miyazawa et al., "Residue-Residue Potentials with a Favorable Contact Pair Term and an Unfavorable High Packing Density Term. for Simulation and Threading," <i>J. Mol. Biol.</i> , 256:623-644 (1996)
	C10	Chao Zhang, "Extracting Contact Energies From Protein Structures: A Study Using a Simplified Model," <i>Proteins: Structure, Function, and Genetics</i> , 31:299-308 (1998)
	C11	Miyazawa et al., "Self-Consistent Estimation of Inter-Residue Protein Contact Enggeries Based on an Equilibrium Mixture Approximation of Residues," <i>Proteins: Structure, Function, and Genetics</i> , 34:49-68 (1999)
	C12	Miyazawa et al., "An Empirical Energy Potential With a References State for Protein Fold and Sequence Recognition," <i>Proteins: Structure, Function, and Genetics</i> , 36:357-369 (1999)
	C13	Moore et al., "Predicting Crossover Generation in DNS Shuffling," <i>PNAS</i> , Vol. 98, No. 6, 3226-3231 (2001)
	C14	Lehman et al., "Engineering Proteins for Thermostability: the Use of Sequence Alignments Versus Rational Design and Directed Evolution," <i>Current Opinion in Biotechnology</i> , 13:371-375 (2001)
	C15	Colleen Kelly, "A Test of the Markovian Model of DNA Evolution," <i>Biometrics</i> 50, 653-664, (1994)
	C16	H.W. Hellinga, "Rational Protein Design: Combining Theory and Experiment," <i>Proc. Natl. Acad. Sci. USA</i> , Vol. 94, pp. 10015-10017, (1997)
	C17	William F. DeGrado, "Proteins from Scratch," <i>Science</i> , Vol. 278, 80-81 (1997)
	C18	Goldman, "An Algorithmically Optimized Combinatorial Library Screened by Digital Imaging Spectroscopy," <i>Biotechnology (NY)</i> , (12):1557-61, 1992
	C19	Youvan, "Imaging Sequence Space," <i>Nature</i> 1994, 369(6475):79-80
	C20	Harayama, Shigeaki, "Artificial Evolution by DNA Shuffling," <i>Tibtech</i> vol. 16 pp 76-82, 1998
	C21	Stemmer, "DNA Shuffling by Random Fragmentation and Reassembly: In-vitro Recombination for Molecular Evolution," <i>Proc. Natl. Acad. Sci. USA</i> vol. 91 pp 10747-70751, 1994
<i>(initials)</i>	C22	Singh et al., "Application of Genetic Algorithms to Combinatorial Synthesis: A Computational Approach to Lead Identification and Lead Optimization," <i>J. Chem. Inf. Compit. Sci</i> vol. 118 pp 1669-1676, 1996

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	C23	Zhang, Ching, "A Genetic Algorithm for Molecular Sequence Comparison," <u>Proceedings of the International Conference on the Systems, Man and Cybernetics</u>
<i>ft</i>	C24	Jonsson, et al, "Quaintitative Sequence-Activity Modeils (QSAM)- Tool For Sequence Design", Nuclear Acid Research Vol. 21, No. 3, pp. 733-739 (1993)
	C25	Sjostrom, et al, "Signal Peptide Amino Acid Sequences In <i>Escherichua coli</i> Contain Information Related To Final Protein Localization. A Multivariate Data Analysis", The CMBO Journal vol. 6, no. 3, pp 823-831, (1987)
	C26	Patel, et al, "Patenting Computer-Designed Peptides", Journal Of Computer-Acid Molecular Design 12 pp543-556, (1998)
	C27	Schneider, et al, "Peptide Design by Artificial Neural Networks and Computer-Based Evolutionary Search", Proc. Natl. Acad. Sci. USA, vol. 95, pp. 12179-121184, October 1998
	C28	Mee, et al, "Design of Active Analogues of a 15-Residue Peptide Using D-Optimal Design QSAR and a Combinatorial Search Algorithm", J Peptide Res. 49, pp. 89-102, (1997)
	C29	Bogarad, et al, "A Hierarchical Approach to Protein Molecular Evolution", Proc. Natl. Acad. Sci. USA, Vol. 96, pp. 2597-2595, March 1999
	C30	Darius, et al, "Simulated Molecular Evolution" Or Computer-Generated Artifacts?", Biophysical Journal, Vol. 67, pp. 2120-2122. November1994
	C31	Moore et al., <u>Modeling and Optimization of DNA Recombination</u> , Computer and Chemical Engineering 2000, Department of Chemical Engineering, The Pennsylvania State University, University Park © 2000
<i>ca</i>	C32	Gregory L. Moore, Costas D. Maranas, <u>Modeling DNA Mutation and Recombination for Directed Evolution Experiments</u> , Department of Chemical Engineering, The Pennsylvania State University, University Park, Received 28, October 1999. Accepted in revised form 15 April 2000 © 2000 Academic Press

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#### U.S. Patent Documents

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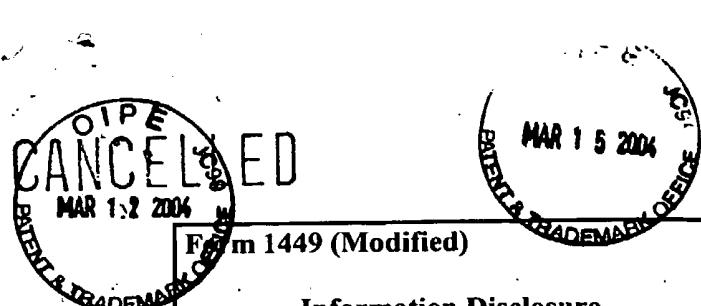
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	B5							

#### Other Documents

Examiner Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
<i>A</i>	C1	CS 262, Computational Genomics, Handout #1: Course Information, printed from: <a href="http://www.stanford.edu/class/cs">http://www.stanford.edu/class/cs</a> , Spring 2003, 11 pages
<i>A</i>	C2	Corpet et al., Browsing Protein Families Via the Rich Family Description Format," Bioinformatics, Vol. 15, No. 12, 1999, Pages 1020-1027
<i>A</i>	C3	Mironov et al., "Computer Analysis of Transcription Regulatory Patterns in Completely Sequenced Bacterial Genomes," Nucleic Acids Research, Vol. 27, No. 14, 1999, Pages 2981-2989
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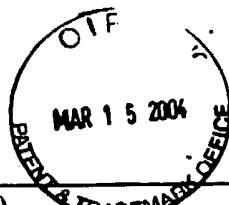
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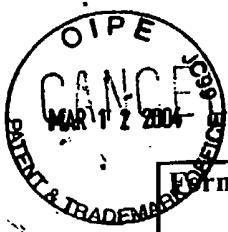
Other Documents

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<i>A</i>	C1	Hellberg et al., "The Prediction of Bradykinin Potentiating Potency of Pentapeptides. An Example of a Peptide Quantitative Structure-Activity Relationship," <i>Acta Chemica Scandinavica B</i> 40, pp. 135-140, 1988
<i>A</i>	C2	Bucht et al., "Optimising the Signal Peptide for Glycosyl Phosphatidylinositol Modification of Human Acetylcholinesterase Using Mutational Analysis and Peptide-Quantitative Structure-Activity Relationships," <i>Biochimica et Biophysica Acta</i> 1431, pp. 471-482, 1999
	C3	Sandberg et al., "Engineering Multiple Properties of a Protein by Combinatorial Mutagenesis," <i>Proc. Natl. Acad. Sci. USA</i> , Vol. 90, pp. 8367-8371, September 1993
	C4	Wrede et al., "Peptide Design Aided by Neural Networks: Biological Activity of Artificial Signal Peptidase I Cleavage Sites," <i>Biochemistry</i> , 37, pp. 3588-3593, 1998
	C5	Jill Damborsky, "Quantitative Structure-Function and Structure-Stability Relationships of Purposely Modified Proteins," <i>Protein Engineering</i> , Vol. 11, no. 1, pp. 21-30, 1998
	C6	Hellberg et al., "Peptide Quantitative Structure-Activity Relationships, a Multivariate Approach," <i>J. Med Chem.</i> , 30: pp 1126-1195, 1987
	C7	Sandberg et al., "New Chemical Descriptors Relevant for the Design of Biologically Active Peptides. A Multivariate Characterization of 87 Amino Acids," <i>J. Med Chem.</i> , 41, pp. 2481-2491, 1998
	C8	Casari et al., "A Method to Predict Functional Residues in Proteins," <i>Nat. Struct Biol.</i> , 2, pp. 171-178, 1995
	C9	Suzuki et al., "A Method for Detecting Positive Selection at Single Amino Acid Sites," <i>Mol. Biol. Evol.</i> 16 (10): pp. 1315-1328, 1999
<i>A</i>	C10	Benner et al., "Amino Acid Substitution During Functionally Constrained Divergent Evolution of Protein Sequences," <i>Protein Engineering</i> , Vol. 7, No. 11, pp. 1323-1332, 1994



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<i>A</i>	C11	Wu et al., "Discovering Empirically Conserved Amino Acid Substitution Groups in Databases of Protein Families," Proc. Int. Conf. Intell. Syst. Mol. Biol., 4, pp. 230-240, 1996
	C12	Adenot et al., "Peptides Quantitative Structure-Function Relationships: An Automated Mutation Strategy to Design Peptides and Pseudopeptides from Substitution Matrices," Journal of Molecular Graphics and Modelling, 17, pp. 292-309, 1999
	C13	Norinder et al., "A Quantitative Structure-Activity Relationship Study of Some Substance P-Related Peptides," J. Peptide Res., 49, pp. 155-162, 1997
	C14	Sandberg, "Deciphering Sequence Data a Multivariate Approach," Ph.D Thesis, Umea: Umea University, 78 pages, 1997
	C15	Eriksson et al., "Peptide QSAR on Substance P Analogues, Enkephalins and Bradykinins Containing L-and D-Amino Acids," Acta Chemica Scandinavica, 44, pp. 50-56, 1990
	C16	Ufkes et al., "Further Studies on the Structure-Activity Relationships of Bradykinin-Potentiating Peptides," European Journal of Pharmacology, 79, pp. 155-158, 1982
	C17	Dobrynin et al., "Synthesis of Model Promoter for Gene Expression in Escherichia Coli," Symposium Series No. 7, pp. 365-376, 1980
	C18	Skinner et al., "Potential Use of Additivity of Mutational Effects in Simplifying Protein Engineering," Proc. Natl. Acad. Sci., Vol. 93, pp. 10753-10757, 1996
	C19	Lathrop et al., "Global Optimum Protein Threading with Gapped Alignment and Empirical Pair Score Functions," J. Mol. Biol., 255, pp. 641-665, 1996
	C20	Hellberg et al., "A Multivariate Approach to QSAR," Ph.D. Thesis, Umea, Sweden: University of Umea: 1986
	C21	Nambier et al., "Total Synthesis and Cloning of a Gene Coding for the Ribonuclease S Protein," Science, 223: 1299-1301, 1984
	C22	Lin et al., "Functional Expression of Horseradish Peroxidase in E. Coli by Directed Evolution," Biotechnol. Prog., 15: 467-471, 1999
	C23	Lathrop R.H., "The Protein Threading Problems with Sequence Amino Acids Interaction Preference is NP-Complete," Protein Eng., 7:1059-1068, 1994
	C24	Hanes et al., "In Vitro Selection and Evolution of Functional Proteins by Using Ribosomes Display," Proc. Natl. Acad. Sci. USA, 94: 4937-4942, 1997
<i>A</i>	C25	Wells et al., "Rapid Evolution of Peptide and Protein Binding Properties <i>in vitro</i> ," Curr Opin Biotechnol, 3:355-362, 1992



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Group  
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<i>R</i>	C26	Johnson et al., "The Traveling Salesman Problem: A Case Study in Local Optimization," In Local Search in Combinatorial Optimization, Edited by Aarts et al., John Wiley & Sons Ltd., 21-310, 1997
	C27	Geladi et al., "Partial Least Squares Regression: A Tutorial," Anal Chim Acta, 168: 1-17, 1986
	C28	Holowachuk et al., "Efficient Gene Synthesis by Klenow Assembly/Extension-Pfu Polymerase Amplification (KAPPA) of Overlapping Oligonucleotides," PCR Methods Appl, 4:299-302, 1995
<i>R</i>	C29	Aita et al., "Theory of Evolutionary Molecular Engineering Through Simultaneous Accumulation of Advantageous Mutations," J. Theor. Biol., 207:543-556, 2000

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<i>A</i>	C1	Martin et al., "Measuring Diversity: Experimental Design of Combinatorial Libraries for Drug Discovery," J. Med. Chem. 38, 1431-1436, 1995
<i>A</i>	C2	Sheridan et al., "Using a Genetic Algorithm to Suggest Combinatorial Libraries," J. Chem. Inf. Compu. Sci., 35, 310-320, 1995
<i>A</i>	C3	D.K. Agrafiotis, "Multiobjective Optimization of Combinatorial Libraries," IBM J. Res & Dev., Vol. 45, No. 3, 545-566, 2001
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<i>A</i>	A2	6,605,449 B1	08/12/03	Short	435	69.1	06/14/00
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